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SARASOTA BAY, FLORIDA
Identification of Resource Management Problems and Issues

REPORT
to the
U.S. ENVIRONMENTAL PROTECTION AGENCY
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by the
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PREFACE

Sarasota Bay, Florida was named in Section 317 of the Water Quality Act of 1987 (the Act) to be given priority consideration for inclusion in the National Estuary Program (NEP). Governor Bob Martinez nominated Sarasota Bay to the NEP in a May 19, 1987, letter to Lee Thomas, Administrator of the Environmental Protection Agency (EPA). The language of the Act provides guidelines for documentation required to support a governor's nomination. The types of information the Agency will need to consider includes the need for a management conference, the likelihood of success of the program and information indicating that existing controls of pollution must be supplemented to ensure the attainment or maintenance of water quality. Enhanced water quality should provide for the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife and allow recreational activities in and on the water.

In 1987 the EPA entered into a cooperative agreement with the Mote Marine Laboratory to assemble information on the environmental status, trends, and environmental problems in Sarasota Bay to support the nomination of the bay to the NEP. The need for an NEP study of the bay, the likelihood of success of the proposed study, and the need for additional controls of pollution to ensure the maintenance or enhancement of water quality in Sarasota Bay were also to be addressed. Toward this end, Mote Marine Laboratory has:

> Assessed available information on the status and trends of environmental quality in Sarasota Bay to support the nomination of the bay to the National Estuary Program;
>
> Identified environmental problems in Sarasota Bay and established goals and objectives for the proposed National Estuary Program Study;
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> Developed information indicating the need for an NEP Study on Sarasota Bay, the likelihood of success of the study and the need for supplements to existing pollution controls to ensure the maintenance or enhancement of water quality in Sarasota Bay.

This report is one product of the research. Another product is a "Bibliography on Sarasota Bay, Its Resources, and Surrounding Areas", which has been distributed for local review. This report and the bibliography will be presented to a workshop of federal, state, and local government representatives, co-hosted in Sarasota by EPA and MML. The Workshop will also develop additional information on Sarasota Bay for use in documenting the need for an NEP Study.

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INTRODUCTION

Sarasota Bay is a small, subtropical embayment on the west coast of peninsular Florida. It is connected to the Gulf of Mexico and to the southern end of Tampa Bay via Anna Maria Sound. Like much of coastal Florida, the Sarasota Bay area is experiencing rapid population growth. Barrier islands between the bay and gulf are completely developed as residential, light commercial, and tourist areas. Nearly the entire upland watershed of Sarasota Bay is also developed, mostly as suburban residential and commercial areas. There are no heavy industries in the watershed, and the amount of agricultural land is low and decreasing due to urbanization. The local economy is driven primarily by retirees, tourism, and the services industry which have developed because of the bay, warm climate, and historical circumstances. For all practical purposes, there has been little more than a century of modern settlement in the bay area.

The bay and its watershed are situated equally in Manatee and Sarasota Counties (Figure 1). The combined population of these counties was 420,500 people in 1986. The largest cities --and county seats-- are located near the bay at Bradenton and Sarasota, in Manatee and Sarasota Counties, respectively. Bradenton Beach and the Town of Longboat Key are two small municipalities on the barrier island of Anna Maria and Longboat Key, respectively. Two other islands separate the bay and gulf south of Longboat Key (Lido, Siesta); Lido Key is within the city limits of Sarasota, and Siesta Key is part of unincorporated Sarasota County. Manatee County participates in the Tampa Bay Regional Planning Council, whereas Sarasota County is a member of the Southwest Florida Council, meaning that Sarasota Bay is divided across the middle into two separate planning bodies. Both counties and the whole bay are within the Southwest Florida Water Management District and the Southwest District of the Florida Department of Environmental Regulation.

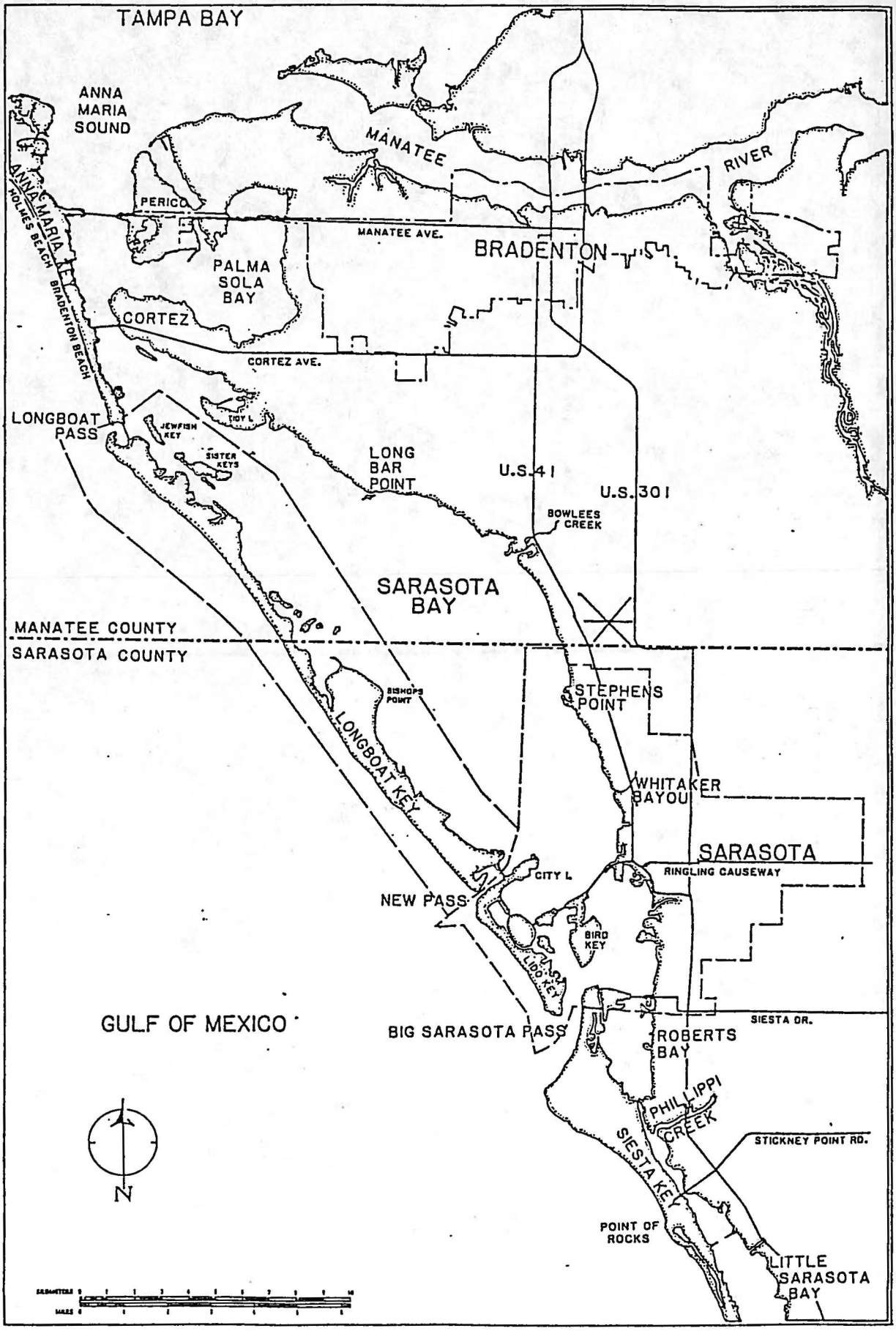

Figure 1. SARASOTA BAY AREA

Resource Description

Sarasota Bay has been called a lagoon, a neutral estuary, and a bay. It is located between Tampa Bay and Charlotte Harbor, the nation's 17th and 18th largest estuaries, respectively. It exemplifies a number of water bodies along the Florida and gulf coasts by its proximity to open, shallow waters; much greater width than depth; physical dominance by wind and tides rather than tributaries; and recreational uses.

The bay area has a mean annual temperature and rainfall of 72.0°F and 54.6 inches of rain per year. Most of the rain (60%) falls between June and September. The bay is approximately 20 miles long and has a mean depth of 5 ft. Deeper portions of the bay's central basin are 8-10 ft deep, and Longboat Pass (between Longboat Key and Anna Maria Island) has a maximum depth of 27 ft. Extensive shallow areas bordering the bay are mudflats, seagrass beds, or wetlands. The bay is subject to a relatively low energy climate. Winds vary to and from the gulf, except during winter frontal systems when northwest winds prevail. Tides are mixed diurnal and semidiurnal, with a mean and extreme range of 1.3 and 2.1 ft, respectively. Average wave heights (on barrier beaches) are about 1 ft, and sediment transport is minimal.

Currents in the bay are tide and wind dominated, ranging between 0.3ft/sec in open bay areas to 1.5 ft/sec within inlets. A nodal area--or zone of little net water movement-- crosses the mid bay area in Manatee County. Flushing time for the bay in general is estimated to be 2-15 days, although actual rates depend upon freshwater inflow. Toward the east and north the bay's watershed is bounded by the Braden and Manatee Rivers, respectively, which flow into Tampa Bay. Uplands within the watershed occupy twice the surface area (80 sq mi) of open bay waters (40 sq mi) and are drained by the Palma Sola, Bowles Creek, Whitaker Bayou, Hudson Bayou, and Phillippi Creek basins. The Phillippi Creek basin is the area's largest. Its impervious area increased from 15% in 1966 to 22% in 1988 and is expected to reach 24% by the year 2000. This trend is believed applicable for the watershed as a whole. Combined peak discharge of nonpoint sources to the bay area are about 13,560 cfs (for a 25 year, 24 hr event over the entire watershed). Treated wastewater

contributes another 15-25 cfs, and there are no industrial discharges of consequence.

Water quality is considered "good" for most parts of the bay[1]. In fact, all waters of the bay except for two small creek mouths are designated by the state as Outstanding Florida Waters, which provides for strict limits to degradation. Incomplete nutrient and other data suggest a general trend of improvement and a decline in salinity which has been most evident along the mainland shore. Urban stormwater runoff has been implicated as the cause for reduced salinities. Areas of "fair" water quality include the bayside waters of Longboat Key, Little Sarasota Bay, and Phillippi Creek. Whitaker Bayou has fair to "poor" water quality because of stormwater and the City of Sarasota's municipal wastewater treatment plant effluent. An area of about 210 acres in the bay is directly affected by Whitaker Bayou discharges, and the area of indirect effects is probably ten times larger.

Direct and indirect effects of dredging and filling have not been evaluated with respect to water quality but are considered serious. Some beaches on all islands have been nourished at least once. Longboat and New Passes have been dredged for navigation purposes. The Intracoastal Waterway definitely caused several areas of bay-bottom to be spoiled; may be responsible for large losses of seagrasses in the north bay due to indirect turbidity effects; and is believed to have caused or enhanced closure of Midnight Pass (in Little Sarasota Bay, between Siesta and Casey Keys). Major residential and commercial filling projects have been conducted on Bird, Lido, and Longboat Keys and City Island. These combined projects have altered circulation, tidal prisms, fine sediment budgets, inlet stability, bay transparency, and other parameters.

The primary producers of Sarasota Bay are phytoplankton, seagrasses, macroalgae, and wetlands (marshes and mangrove forests). The system is converting from a phytoplankton-dominated one with significant contributions (of carbon fixation, habitat, etc.) by the other producers,

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[1]According to 305b summaries by the Florida Department of Environmental Regulation, using water quality (marine) and trophic state (aquatic) indices.

to a more simplified system dominated by phytoplankton without these other producers. Sarasota Bay and nearby waters are regularly affected by naturally occurring dinoflagellate blooms known as red tides. These blooms originate far offshore but may be perpetuated by inshore nutrient enrichment. Red tides defaunate affected areas of the bay and inhibit tourism. During summer months local phytoplankton blooms also kill fish in canals.

There are five seagrass species in the bay; all grow in water less than 6-7 ft deep. Between 1948 and 1979 there was a 54% decrease in seagrass cover along the eastern bay; a 65% loss around New Pass; and an 83% loss around Whitaker Bayou. Baywide losses are estimated to be 20-30 percent. Causes of these losses are not definitely known, but mineral turbidity (from beach, inlet and ICW dredging) and organic turbidity (from STP effluents) are suspected. Marshland is naturally rare in the bay, but three species of mangroves grow along protected intertidal shorelines instead. Forests have been ditched for mosquito control and filled for upland development. Bay shorelines have been altered five-fold since 1948, mostly by bulkheading and invasion of two exotic tree species.

Shallow, protected waters and once-widespread seagrasses supported an abundance of shellfish, sport and commercial fishes and unique vertebrate species. The shellfish resources of the bay were based on hard clams, oysters, and scallops. Scallops have disappeared from the bay, not having been landed commercially since 1964. Oyster landings ended in 1967 and hard clam landings ended in 1971, but both are still present in the bay, and there are probably enough hard clams to support a renewed harvest. Actual harvesting would be limited to 2 areas conditionally approved by the state for adequate sanitation (Palma Sola Bay[2]; Longboat Key bayside) unless pollution abatement allowed new areas to be opened.

Blue crab, stone crab, and (pink) bait shrimp are also taken from the bay. There are 153 commercial blue crab permits and 180 stone crab

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[2]Palma Sola Bay has been closed since 1981.

permits issued for the two county area. Blue crab landings show marked, continual declines from 177,000 lbs/yr in the 1950's to about 30,000 lbs/yr today. Overfishing and habitat loss are believed responsible for the decline. Stone crab landings (of claws only) have increased from 6,400 lbs/yr to 24,000 lbs/yr over the same period due to increased demand. Bait shrimp landings have fallen precipitously, causing some to regard the fishery as completely collapsed -- but this may be an artifact of reporting. Some commercial bait fishing currently occurs in the bay.

Sarasota Bay's finfish resources are mullet (commercial only), red drum and spotted seatrout (commercial and sport), and snook (sport only). Mullet represents the largest fishery, with 2 to 6 million lbs landed annually. Whole fish are sent to local markets and manufacturers of fish products. Mullet roe has become a major byproduct, shipped to oriental markets. There may be some decline in mullet landings, but trends are indefinite. Spotted sea trout landings, however, have fallen six-fold from 300,000 lbs/yr in the 1950's, due to the destruction of seagrasses and probably overfishing. Red drum landings peak at about 200,000 lbs/yr and vary widely. In the 1980's, landings have been near 50,000 lbs/yr. The status of red drum has been declining throughout Florida, and last year seasons were adopted for their protection. Snook is a highly prized sport fish for which there are no landing data, but concern over their diminishing number has caused the adoption of seasons, plus limits to size, gear, and catch. Declines in snook stocks are attributed to habitat loss and overfishing.

Unique or important vertebrates in Sarasota Bay include the Atlantic loggerhead turtle, bottlenosed dolphin, and West Indian manatee. Sea turtles use barrier beaches for nesting. In Manatee and Sarasota Counties combined, about 1000 nests are established per year. Their success depends on storms, natural predators, and beach management practices. Dolphin populations have been studied longer in Sarasota Bay than anywhere else in the world. Dolphins probably use the bay as a breeding ground and their numbers are stable, which is in marked contrast to manatees, an endangered species. Manatees occur in Sarasota Bay during summer months and use the bay as a corridor prior to the cold

season. Between 25 and 50 manatees are believed to inhabit the bay on this basis. The animals are threatened most by high speed boat traffic.

Sarasota Bay supports or enhances about 50 basic, water-dependent industries, institutions, and operations and about $20 million annually in overall payrolls. This direct benefit is augmented by an undocumented, indirect economic benefit and also by $115 million of economic value in the bay as a wastewater and stormwater receptacle. In addition, residential, waterfront property has an estimated value of $1.9 billion. Close proximity to the bay results in excess of 19% of the residential tax-return in the two counties.

Recreation constitutes the major use of the bay in the forms of boating, skiing, diving, surfing, fishing, sightseeing, and nature study. There are about 30,000 registered boats in the two county area, mostly pleasure craft. In 1985 there were almost 13 million beach use and saltwater fishing "occasions" in Manatee and Sarasota Counties. A dozen conservation and environmental groups have a combined membership of nearly two thousand persons (see page 26). The bay is used for educational purposes by one university, one community college, several high schools, and a marine program for youthful offenders (page 27).

History of Settlement and Resource Management

The Sarasota Bay area is urbanized in terms of its actual watershed, but the system is different than older, urbanized ones because it is recently settled and still has large areas of surrounding open space, farm land, and natural areas. The bay and basin have experienced only about 100 years of settlement. The period prior to World War II saw relatively little change in land or bay use, and environmental laws have been in effect for the past 15 years, so it was mostly during the period 1945-1975 that significant alterations to the bay and upland occurred. Today extensive areas of the watershed support land uses first put there (except for pasture or open range). This situation means that infrastructure is not as complex, well developed, or permanent as in northern coastal areas, so changes in land use, storm drainage, sewerage, or shoreline conditions may be easier or less expensive to accomplish.

The proximity of undeveloped interior lands may also facilitate projects which benefit the bay. Sewage treatment, for example, may be easier to provide at inland sites where gross densities are an order of magnitude lower than along the coast.

Today Sarasota Bay is more regulated than it is managed. Regulatory limits to projects with adverse impact exist at the federal and state level, but local regulation can be traced to public outcry over expansion of Bird Key and destruction of mangrove forests on the bay side of Longboat Key by a real estate development company. Local regulations were adopted to limit similar projects and to establish waters in the City of Sarasota as a marine park. Since then, the regional water management district has implemented rules controlling runoff and surface water management projects, and the state has (through the Department of Environmental Regulation - DER) enforced legislative acts addressing nonpoint and wastewater treatment levels. Most recently, in 1985 the Environmental Regulatory Commission designated Sarasota Bay as an "Outstanding Florida Water" (OFW), bringing into play the severest effluent regulations that are currently available in the state. Basically, OFW status requires that the DER issue no permit which directly lowers existing ambient water quality or indirectly degrades the OFW. The OFW status does not provide a management framework for the waterbody, even where water quality issues are concerned.

Sarasota Bay's unmanaged status is similar to most of Florida's coastal waters. Well developed management programs[3] exist only for the state's largest systems (Apalachicola, Tampa, and Biscayne Bays, Charlotte Harbor and the Indian River Lagoon); one national park (Everglades); a national estuarine sanctuary[4] (Rookery Bay); and a national marine sanctuary (Looe Key). More than 40 coastal sites are

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[3]Program refers to the existence of goals and objectives; a coordination system such as a plan; mechanisms for affecting programs or policies of other governmental units; and other features associated with resource management.

[4]Apalachicola Bay is also a national estuarine sanctuary.

Florida aquatic preserves or state wild and scenic rivers: these sites have adopted plans or have plans under development which are more limited in scope than the bay management programs.

There have been several steps leading toward a management program for Sarasota Bay. In 1985 the state legislature passed the Local Government Comprehensive Planning and Land Development Regulation Act, creating a new coastal management section in state law. The law was amended in 1985-86 and requires local governments to address specific plan topics; coordinate plans with neighboring governments; and be consistent with regional plans. Special effort must be made to ensure that "certain bays, estuaries and harbors that fall under the jurisdiction of more than one local government are managed in a consistent and coordinated manner". These requirements may set the stage for bay management, but revised plans alone will not contribute to a comprehensive program unless (1) the bay is viewed in its entirety by each plan; (2) the process leads to an institutional advocacy for the bay; and (3) each plan adopts the same language relative to the bay. These final measures are not required by state law, and the extent to which planning efforts would be redirected to achieve them remains to be seen.

Another significant advancement for Sarasota Bay's management can be traced to the 1982 Tampa Bay Scientific Information Symposium, at which existing knowledge about that bay was reviewed and evaluated for management purposes. The symposium led rapidly to a series of work groups culminating in an Agency on Bay Management within the Tampa Bay Regional Planning Council. The Agency adopted a management plan for Tampa Bay and is in its second year of implementation. Success in the Tampa Bay setting encouraged scientists and resource managers to meet in 1986 to assess the need for a management program for Sarasota Bay. The 1986 workshop recognized the value of such a program and endorsed a public symposium similar to that held for Tampa Bay. The symposium, known locally as SARABASIS[5] was held in 1987, and written proceedings

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[5]for Sarasota Bay Area Scientific Information Symposium.

will be available in 1988. Material from SARABASIS has been distilled for use by local planning agencies. Late in 1987 an estuarine seminar was held in Washington, D.C. on Tampa and Sarasota Bays under the sponsorship of the National Oceanic and Atmospheric Administration; SARABASIS materials also aided in preparation for that seminar.

In 1987 the 100th Congress reauthorized the Water Quality Act, which contained a part (Section 317. National Estuary Program) instructing the Environmental Protection Agency (EPA) to identify and protect nationally significant estuaries and to encourage development of comprehensive conservation and management plans. The Act states that the Administrator of the EPA is to give priority consideration to 12 coastal systems including Sarasota Bay. The Governor of Florida formally nominated Sarasota Bay to the EPA in May 1987, and in July 1987 Florida and EPA entered into a State/EPA agreement by which the EPA and DER will continue the nomination process for inclusion of Sarasota Bay in the National Estuary Program (NEP).

PROBLEM IDENTIFICATION

Resource management problems and issues can be identified from historical references, workshop and conference proceedings, local government plans, and other sources. In most cases the problems can be identified but not described or detailed. Indeed, the inability to understand the specifics of an issue contributes to the problem.

This section tabulates all of the problems and issues which could be identified on Sarasota Bay, its resources, and surrounding areas (Table 1). Major groupings were used to organize the list, following the outline of previous problem summaries. No ranking of items within a group was intended, although the relationship of problems is described in a subsequent section.

Problem descriptions can only be developed once they are ranked by importance and studied in greater depth. This process is part of a NEP Management Conference but would also occur in a non-federal management initiative. In either case, key questions to address in the process of problem review will include (1) is the perception of the problem accurate; (2) does the problem influence a large part of the estuary; (3) can the likely cause of the problem be identified; and (4) is it feasible to correct the problem?

Table 1. List of Resource Management Problems and Issues in Sarasota Bay and Surrounding Areas. No priorities are intended by the order of listed items.

A. Geological
1. Increased fine sediments from beach projects.
2. Increased fine sediments from inlet projects.
3. Increased fine sediments from channels and spoils.
4. Increased fine sediments from nonpoint sources and wastewater.
5. Infilling of canals with sediments.
6. Erosion of beaches.
7. Erosion of bay shorelines.
8. Lack of integrated beach and inlet planning.
9. Unused channels, basins and borrow pits.
10. Spoil island and shoal erosion.
11. Migration of dredge spoils from offshore dump sites.
12. Restoration and management of beach dunes.
13. Erosion and vandalism of Point-o-Rocks.
14. Infilling of Hudson Bayou.

B. Hydrological
1. Sea level rise.
2. Altered circulation and flushing.
3. Increased wave energy from boat wakes.
4. Increased wave energy from hardened shorelines.
5. Increased runoff from uplands.
6. Altered hydroperiods in upland systems.
7. Declining salinity.
8. Intracoastal Waterway impacts in Lower Sarasota Bay.
9. Closure of Midnight Pass.
10. Operation of reservoirs in Manatee County.
11. Poor flushing of Grand Canal.
12. Impacts of mosquito control ditches.
13. Runoff from barrier islands.

C. Chemical
1. Eutrophication.
2. Nutrient enrichment in canals.
3. Nutrient enrichment in tributaries.
4. Nutrient enrichment in isolated embayments.
5. Oxygen depletion in canals and tributaries.
6. STP precipitation of $CaCO_3$.
7. Nonpoint source loads of nutrients, metals, biocides.
8. Contaminant accumulation in bay sediments.
9. Decreased transparency.
10. Oil, grease and toxic paints from boats and marinas.
11. Closure of Midnight Pass.
12. Impacts of mosquito control chemicals.
13. Closure of Palma Sola Bay for shellfishing.
14. Offshore oil spills.
15. Septage wastes from leisure craft.

Table 1. continued.

16. Contamination of Marina Jack basin.
17. Nutrient enrichment from Tidy Island to Long Bar Point.
18. SKUA effluent into Grand Canal.
19. Aeration test in Bayshore Gardens/Trailer Estate.
20. City of Sarasota STP effluent in Whitaker Bayou.

D. Biological

1. Phytoplankton blooms.
2. Red tides.
3. Macroalgae blooms.
4. Loss and alteration of shallow water habitats.
5. STP effluent and nonpoint discharge impacts to benthic fauna.
6. STP effluent and nonpoint discharge impacts on shellfish areas.
7. Exotic plant species.
8. Uncontrolled predators in rookeries.
9. Seagrass losses.
10. Loss of scallops.
11. Declines in specific fisheries.
12. Propeller damage to seagrasses.
13. Fishery allocations to sport vs. commercial users.
14. Unauthorized mangrove trimming.
15. Manatee losses due to collisions.
16. Turtle nest loss to predators and vandalism.
17. Turtle hatchlings loss to predators and disorientation.
18. Harassment of marine turtles, birds, mammals.
19. Overharvest of collectible species.
20. Loss of tidal creek habitat.
21. Closure of Midnight Pass.
22. Impacts of mosquito control ditches.
23. Abandoned fishing nets and traps.
24. Loss of salt flats and high intertidal habitats.
25. Eutrophication of Grand Canal, Heron Lagoon.
26. Erosion of Bay Isles mangrove bar.
27. Seabird panhandling.
28. Restoration of hard clam fishery.
29. Parasitism of fishes in tidal creeks.
30. Bowlees Creek habitat restoration.
31. Greer Island management plan.

E. Cultural

1. STP effluent and nonpoint discharge impacts on recreation.
2. Loss of access points to bay.
3. Boat traffic congestion.
4. Conflicting vessel uses.
5. Unclassified shellfish areas.
6. Post-hurricane contingency plans.
7. Cross bay bridge.
8. Restrictions to scenic access.

Table 1. continued.

9. Beach access.
10. Litter.
11. Noise.
12. Erosion of Cortez Village as a cultural resource.
13. Closure of Midnight Pass.
14. Use of Payne Terminal (Centennial) Park.
15. Apathy and inexperience regarding hurricanes.
16. Funding of beach nourishment projects.
17. Lack of fishing piers.
18. Use of City Island.
19. Division of bay into 2 regional planning councils.
20. Acquisition of Emerson Point, Riverbay and Perico Island.
21. Scheduled vs. demand bridge openings.

F. **Regulation and Management**

1. Uncoordinated monitoring programs.
2. Inconsistent tree ordinances.
3. Accumulation of local acts regulating fishing.
4. Lack of goals and objectives.
5. Independent, inconsistent permitting procedures.
6. Inadequate compliance monitoring and enforcement.
7. Lack of a bay management plan.
8. Inconsistent dock permitting procedures.
9. Coordination with Agency on [Tampa] Bay Management.
10. Inadequate coordination between scientists and governments.

G. **Education and Research**

1. Discharge and loading in <u>tidal</u> creeks.
2. Fine sediment budget for bay.
3. Resource inventory and monitoring.
4. Circulation model for bay.
5. Fishery stock assessments.
6. Measurement of recreational harvests.
7. Bay resource atlas.
8. Signage for turtles, manatees, birds.
9. Guidelines for waterfront property owners.
10. Public forums on bay issues.
11. Stormwater impacts to bay.
12. Relation of groundwaters to surface waters and bay.
13. Measurement of secondary economic benefits.
14. Baseline program for sea level rise.
15. Lack of bay related educational programs.
16. Need to evaluate and verify water quality trends.
17. Poor dissemination of environmental information.
18. Lack of synthesized data base and data outlet.
19. Need for more open-water monitoring stations.
20. North Creek monitoring and trend analysis.

MAJOR PROBLEM AREAS

An initial milestone of management conferences convened under the National Estuary Program -- or any resource planning process -- is the identification and ranking of priority problems. If an NEP management conference or other management initiative begins in Sarasota Bay, it will be necessary to examine problems in Table 1 (plus others obtained by different methods) to determine the validity, data base, courses of action, and probability of success for each.

The preceding section and this one deal with problem identification rather than problem description or documentation. This section organizes the 120 individual problems and issues listed in Table 1 into a few condensed sets and arranges the sets with respect to management complexity. Criteria used for the sets and arrangements were (1) overlap with other problems; (2) extent to which problem concerns the cause of many other problems; (3) responsiveness to local needs; (4) recognition of MC strengths; (5) the degree to which a problem is unique to the area, or is of national significance but may be easier to address in the Sarasota Bay area because of other circumstances; and (6) the probable role of federal, state and/or local involvement.

The sets are arranged from most federal involvement to most local involvement in Table 2. No priorities are implied by the order of sets within each level. Sets are meant to be organizing concepts around which management projects can develop, assimilating a number of specific, related problems in the process. Not all specific problems can be addressed by the sets described below, but refinement of the approach should improve such coverage.

Table 2. **Major Problem Sets for Sarasota Bay, in Order of Management Complexity. No priorities are intended by the order of listed items.**

A. Federal, state, regional and local participation

These problem sets would benefit from a significant level of federal participation in addition to state, regional and local involvement.

- Stormwater runoff. The watershed is mostly developed and programs to retrofit existing developed areas will be complicated and costly. Stormwater is a serious problem in the bay, but improvements to runoff management systems should be measurable in terms of bay resources and values. Response to runoff projects will be easier to detect than in systems facing multiple stresses. Studies of runoff in tidally affected creeks would be nationally significant.

- Beach/inlet/channel management. At present, beaches are (or can be) nourished by federal or state or local agencies, or private parties. Inlets may be dredged for navigation, beach spoil, or both goals. Approach channels and the Intracoastal Waterway are managed with minimal local role. Impacts of these combined, inter-related activities are significant and tools developed to manage these impacts would be nationally useful. The opportunity to address these problems may be unique to the bay area[6].

- Habitat creation and restoration. A number of specific problems concern habitat. The special problem of habitat in Sarasota Bay is the lack of suitable, naturally occurring sites. Impaired habitat can be restored, but significant habitat gains will be more complicated to justify, design, implement and evaluate. A federal involvement will be needed to develop habitat creation projects in urban settings where potential space is limited. Such projects would be nationally useful, however.

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[6]Among priority systems named in the Clean Water Act.

Table 2. continued.

- o Sea level rise (SLR). Federal involvement in this issue far outdistances state activity despite Florida's special relation to the sea. The development of a meaningful assessment of SLR impacts for Sarasota Bay would help the area in terms of research and contingency plans and also represent a national demonstration project for community-level participation. The issue is also relevant to turbidity, habitat, stormwater and other major problems.

B. State, regional and local participation.

These problem sets are probably amendable to solution by non-federal governments if coordinated in a management conference framework. Federal participation could enhance specific work elements through application of national expertise.

- o Coordinated monitoring. This set includes problems of data retrieval, synthesis, and application to management issues, and also adjustments and additions to water quality and other environmental samplings in the bay. A relevant model may be the SWIM data compilation project underway in Tampa Bay.

- o Shellfish sanitation. Conditionally approved areas are closed on intermittent or continuing bases. Harvests in other areas are prohibited due to runoff, or prohibited by default because the area has not been evaluated. A program to reopen, open, and study these areas is needed.

- o Fisheries assessment, management and restoration. This problem set addresses the unknown status of shellfish and finfish stocks; recreational effort; local laws; allocation disputes; and habitat needs. Protection of stone crabs and bait shrimp, and restoration of scallops deserve special effort.

Table 2. continued.

- o Access improvements. Taken collectively, problems of scenic, beach, boating, and passive access form a set of significant impediments to full use of the bay. Access builds a popular constituency for the bay which creates support for other management problems but will require state and regional effort to accomplish during initial project stages.

C. Regional, local and private participation

These sets are probably amendable to solution without extensive commitment of federal or state resources other than their role in providing a management framework. As in the previous case, federal or state involvement would significantly enhance specific work elements.

- o Coordinated planning. It does not appear that coordination requirements of state planning laws will be met for Sarasota Bay, much less their codification in capital improvement, land use, or other implementation measures. Emphasis needs to be placed on adjoining governments and specific consistency between regional plans.

- o Plans for geographic areas of particular concern (GAPC). This set recognizes the many site-specific management needs occurring around the bay, and would create a mechanism within the larger conference process to develop GAPC plans with goals, plans, studies, etc. tailored to each area's particular needs.

- o Educational programs. The lack of general and specific educational programs is one of the most often cited problems regarding Sarasota Bay. Educational programs, public participation, and related activities are central to all phases of bay management but can be handled adequately by regional and local governments.

Table 2. continued.

- Boat traffic improvements. This set addresses wake erosion, manatee protection, seagrass signage, multiple uses, bridge operation, marina practices, and related problems. Access and use cannot be formally restricted, so policies and procedures related to boating must be developed to accommodate a growing boater population.

D. Local and private participation

With the incentive and technical support of a management conference, local governments and private citizens should be able to make significance contributions to the health of the bay in several areas.

- Shoreline protection and management. A uniform, rational and ecologically beneficial approach is needed by local governments and waterfront landowners to remove seawalls, optimize dockage, enhance native vegetation, and control litter. (This set refers mostly to bay shorelines but could be addressed in conjunction with gulf beach projects.)

- Control of exotic tree species. Encroachment of natural shorelines by Brazilian pepper and Australian pine, and, to a lesser extent, ornamental vegetation can be effectively prevented through a cooperative program involving local governments and citizens.

MANAGEMENT ANALYSIS

Management is often taken to mean the identification and elimination of existing problems with respect to natural resources. In the case of estuarine management, these problems usually involve forms of pollution. Estuarine management in Florida has taken a broader approach than abatement of existing pollution[8]. Pollution often plays an equal or lesser role than development or overuse in the status of many Florida estuaries, including Sarasota Bay. In this regard, Sarasota Bay is an excellent setting in which to address the reversal of development and overuse impacts. The Sarasota Bay setting is uncomplicated by significant amounts of agricultural runoff, industrial contaminants, biocides, mining or processing wastes, power plants, heavy shipping, or untreated sewage.

The Need for the Conference

The need for a management conference can be stated in terms of benefits to Sarasota Bay, and also with respect to the larger mission of the National Estuary Program. Where Sarasota Bay is concerned, the following points are true:

1. Population growth in the bay area is probably more rapid than in any other NEP system, causing daily increases in development and use pressure.
2. The bay is an unmanaged system. It is different than estuaries with existing management programs in this regard.
3. Water quality planning under federal and state law is not complete but would not provide for resource management in the broader sense, even if complete.

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[8]The 1986 Sarasota Bay Workshop identified the benefits of a management program as local plan input, improved monitoring, management-driven research, enhancement of bay productivity, and permit guidance in addition to elimination of existing problems.

4. Coordination of local government comprehensive planning efforts is not meeting legal requirements with respect to the bay, but even if met the plans would not provide for resource management in the broader sense.
5. The sense of the community is that a baywide management program is needed and that a commitment to participate has been demonstrated.

From the vantage of the National Program, it is also true that:

6. Congress named Sarasota Bay as a priority system in the Water Quality Act of 1987.
7. Sarasota Bay is the only subtropical system under consideration in the National Program.
8. The bay is very similar to many smaller estuaries and lagoons, both in terms of natural features and management issues. It is therefore a more relevant model for such systems.
9. The bay is relatively small and has comparatively few major problems. These problems can be defined with precision, and the benefits of their solution can be documented without complications, making national application of local advancements easier to accomplish.
10. Because several of the major problems can be meaningfully addressed without extensive federal participation (other than the framework of the management conference), the return on federal effort of benefits to the bay will be proportionately higher.

National Significance

Sarasota Bay's inclusion in the NEP is nationally significant for many of the reasons listed above. As an estuary, the bay is also significant for the reasons that make all estuaries significant to the nation. Compared to other national estuaries, the bay ranks very low in terms of restoration need. Sarasota Bay is still a very clean, healthy

system used primarily for contact recreation, aesthetic benefits and sport fishing[9].

Sarasota Bay should rank highly in terms of preservation need because it is in comparatively good condition, but it is under considerable risk. The most significant risks facing the bay are given in Table 3, which confirms that threats from development and overuse are as serious --or more serious-- as pollution with respect to the long-term maintenance of benefits and values.

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[9]The 1987 Sarasota Bay Scientific Information Symposium identified the major values and benefits of the bay a habitat, recreation, aesthetics, tourism and the economy, and education/research.

Table 3. Pollution Risks and Threats from Development and Overuse in Sarasota Bay.

Pollution Risks

1. STP effluent in specific bay segments will continue or aggravate local water quality problems. However, the city of Sarasota's effluent is being diverted from the bay in 1988, and improvements to Manatee County's treatment systems should alleviate indirect discharges to the north bay area in the near future. Improvements to shellfish areas are expected as a result.

Pollution Risks and Development Threats

1. Stormwater runoff contributes by far more of the total suspended solids and 30-50% of nutrients, compared to point sources, and the amount of stormwater is expected to increase with urbanization. The impact of stormwater in Sarasota Bay is probably an alteration of transparency and resulting loss of seagrasses, especially when combined with STP effluents. Sedimentation and sediment contamination will significantly worsen as the region's population and infrastructure grow.

2. Taken together, point and non-point nutrient enrichment will continue and aggravate blooms of phytoplankton and macroalgae. These blooms create anoxic conditions, kill fish and invertebrates, and inhibit recreation. Local areas of the bay have severe algal blooms now. Increased nutrients in a warm, shallow and clear system such as Sarasota Bay will promote eutrophic conditions. Poorly flushed waters behind Midnight Pass are showing increased levels of eutrophication.

Development and Overuse Threats

1. Habitat loss is certain to continue via cumulative effects of permitted and nonpermitted projects; indirect impacts; deterioration from overuse or improper management, and exotic species invasion. Seagrasses are particularly vulnerable to propeller damage.

2. Some shellfish resources have collapsed due to habitat loss and overharvest and other resources will not be able to support increased harvest without similar effect, especially where critical habitat is being lost. Without increased stock, catch per unit effort must decline as effort increases, and allocation disputes will intensify.

3. Problems associated with recreation and boating are building in proportion to population size. These multiple use conflicts result in diminished recreational benefits and also cause indirect environmental impacts, as in the cases of wake-generated erosion, propeller damage to seagrasses, manatee deaths, and accumulations of oils, grease and toxic paints.

New Initiatives in the Near Term

One of the innovative aspects of the Sarasota Bay nomination concerns the need and opportunity to develop an integrated program for beach nourishment, inlet maintenance, and waterway maintenance. As previously described, barrier beaches in the Sarasota Bay area are renourished as federal, state, or local government programs or private initiative. Sediment sources include offshore borrow areas, ebb-tidal deltas, and inlets. Inlets are maintained as federal or local programs. Access channels are maintained as local or regional government programs or private initiatives. The Intracoastal Waterway is maintained as a federal project. None of this dredging occurs within a coordinated planning framework, so schedules, permits, funding, and monitoring progress on independent tracks with unknown (but probably adverse) effects on economy, efficiency, and effectiveness.

These physical changes are believed to have caused --and continually cause-- significant alterations to Sarasota Bay and adjacent areas by altering beach sediment dynamics, affecting inlet bypassing, impacting tidal deltas and the biota they support, increasing erosion near inlets, changing boundary conditions for the bay (such as tidal prisms and current velocities), introducing fine sediments into the bay system, keeping fine sediments in the system longer, covering productive areas of bay bottom, increasing turbidity, altering circulation, and affecting the movement of estuarine animals.

For these reasons, there is a need to supplement the existing regulatory and planning process where beach nourishment and management, inlet channel maintenance, and related issues are involved. Assistance in obtaining federal cooperation will be of particular importance. A commitment by state regulatory and natural resource departments is also needed but probably could not be obtained outside the framework of a management conference, for financial and other reasons. Development of an integrated plan creates an opportunity to address a number of specific bay problems and for that reason it was listed as a major bay issue (Table 2).

New Initiatives in the Long Term

Control of nonpoint sources in the Sarasota Bay area will require significant advancements beyond previous federal and state regulaions and management tools. The watershed is very flat, subject to intense summer rains and flooding, has a high water table, and is close to sea level. Creeks and built drainage systems are tidally influenced over much or all of their respective lengths. Tidal action has seriously confounded efforts to measure loading and impacts and also has been a major design problem for retention systems and other nonpoint controls. It may be possible to link habitat programs to stormwater projects, given the tidal character of the drainage system. Drainageways may be an important resource for habitat creation because of the natural relationship of wetlands to areas of low relief, and because most of these areas are either publicly owned, maintained, or used by easement. Another possibility for long-term habitat improvements may exist in the new inlets, shoals and deltas, beaches, and wetlands that will be created after very strong hurricanes. Contingency plans will be needed in order to take advantage of such events on a timely basis. All of these projects are also related closely to sea level rise because rapid rise of sea level is certain to affect drainageways, habitat, and the vulnerability of coastal resources to hurricanes.

The case for other new initiatives being necessary --because existing management tools have been insufficient to protect beneficial uses of Sarasota Bay-- must fall to the State of Florida to demonstrate. Based on earlier sections, two areas in which such initiatives could be considered include stormwater runoff and habitat enhancement.

Likelihood of Success

Several aspects of this subject concern state agency involvement which is beyond the scope of the present report. Some points can be made from a local perspective, however.

1. Previous and Ongoing Efforts

a. The Florida Department of Natural Resources has developed a habitat restoration plan for Sarasota Bay (in Manatee County) and sponsors finfish hatchery research at the Mote Marine Laboratory.

b. Federal 201 and 208 grant programs have been administered by the Florida Department of Environmental Regulation and both regional planning councils involved with Sarasota Bay. There have been two 208 studies of Phillippi Creek, the bay's largest tributary.

c. The Florida Department of Environmental Regulation evaluated Sarasota Bay and recommended it for designation as "Outstanding Florida Waters". Designation occurred in 1985 and the DER applies OFW criteria to all permit decisions in the bay.

d. Several state (and regional) agencies have supported the Sarasota Bay Scientific Information Symposium, NOAA Estuarine Seminar, and other efforts to assess historical data for management purposes.

2. New Organizations.

a. Since 1985 two resource management bodies have been established within the framework of state government, in areas immediately adjacent to Sarasota Bay, namely the Agency on [Tampa] Bay Management, and the Myakka River Management Coordinating Council.

b. In 1986 the DER established a Seagrass Task Force to examine the status and trends of this threatened state resource. Findings and recommendations of the Task Force will be relevant in Sarasota Bay.

3. Matching Funds.

Local interest in matching is evident in county and city sponsorship of the Sarasota Bay Symposium (approximately $30,000). These expenditures may qualify as matching in light of the relation of the Symposium to the management

conference process. The state of Florida was aware of dollar matching requirements of the 1987 Water Quality Act at the time of Sarasota Bay's nomination. Dollar matching will be required for new staffing, research, and other CCMP tasks.

4. Public Support.

a. Ever since the 1986 Workshop, a group of citizens, resource managers, and scientists has met as the Sarasota Bay Steering Committee to plan the 1987 Symposium, coordinate bay-related projects, and support the NEP nomination. The Committee includes representatives of each city and county government, New College and Manatee Community College, Florida Sea Grant Program, citizen groups, and Mote Marine Laboratory.

b. There are several citizen groups with specific concerns for Sarasota Bay, such as Save Our Bays, Inc.; Midnight Pass Society; American Littoral Society; Sarasota Shell Club; Manasota 88; Izaak Walton League; Audubon Society; Sierra Club; Organized Fishermen of Florida; Florida League of Anglers; Florida Conservation Association; Manatee-Sarasota Fish and Game Association; Save Our Snook; Sarasota Sailing Squadron; Beach Preservation Associations; and a number of diving, fishing, surfing, and boating clubs.

c. Citizen involvement in local government activities affecting the bay include eight advisory boards or committees in city and county governments, the Florida Sea Grant Marine Extension Advisory Committee, and the TBRPC Agency on Bay Management (Manatee County only).

d. Other interested groups include neighborhood associations, Chambers of Commerce, Boards of Realty, Leagues of Women Voters, and retiree associations.

e. There is an extensive amount of documentation available on the involvement of citizens in bay-related affairs, including the resolution of multiple use conflicts; clean up projects, long range issues such as sea level rise, oil

exploration, and offshore mineral mining; and fishing conflicts.

f. Sarasota Bay is used heavily for educational programs, including Sarasota County's Comprehensive Environmental Education Program; Sarasota County's High School marine biology courses; New College thesis and independent study research; adult education programs sponsored by Manatee and Sarasota County School Boards, Mote Marine Laboratory, and others; and marine science summer camps sponsored by Mote Marine Laboratory.

5. Research.

a. A review of literature on Sarasota Bay, its resources, and surrounding areas produced a bibliography of approximately 300 citations covering most areas of concern for resource management.

b. Citations in the bibliography are divisible by authorship into contributions by government agencies, Mote Marine Laboratory, New College and miscellaneous sources, in decreasing order of output. (Reports by government agencies included a number of engineering and consulting reports performed under contract on a wide range of subjects.)

c. Mote Marine Laboratory (MML) is an independent, nonprofit institution established in 1955. It is situated directly on Sarasota Bay and has a staff of 65 scientists, specialists, technicians and administrators, plus a large volunteer corps. The Laboratory conducts research in marine, estuarine, and riverine environments including Sarasota Bay. MML has an annual budget of approximately two million dollars and derives income from grants, contracts, and donations. The Laboratory sponsored the 1986 Sarasota Bay Workshop; cosponsored the 1987 Symposium; coordinates the Sarasota Bay Steering Committee; and is producing the Symposium Proceedings. Contributions by MML to the science and management of Sarasota Bay are available

at the Laboratory, appear in the bibliography, and will appear in the Symposium Proceedings. Key among these are pre-nomination documents provided to DER, a Sarasota Bay "White Paper", and this report. Technically, MML has cooperated with federal and state agencies in a number of estuarine environmental assessments along the west coast of Florida. These projects span chemical fate and effects, endangered species monitoring, resource inventories, impact assessments, policy analyses, and baseline data collection. MML has federal and state approval for program and project quality assurances and quality controls.

d. New College is a small liberal arts school operated as the undergraduate honors program of the University of South Florida at Sarasota. The College awards Bachelor of Arts degrees in natural and social sciences, the arts, and environmental studies. All students are required to produce a senior thesis, and many have worked on problems of bay ecology and management. Students are also required to participate in independent study projects, some of which have addressed Sarasota Bay. Faculty have also conducted research in the bay. Most student and faculty study of the bay has originated in the Division of Natural Sciences and the Environmental Studies Program (ESP). The ESP is an interdisciplinary program which cosponsored the Sarasota Bay Symposium, teaches courses on the local environment, and facilitates student research. Faculty and students from New College have worked closely with scientists at Mote Marine Laboratory on a number of projects.

Preliminary Goals and Objectives

Goal statements specific to Sarasota Bay do not exist at present, which is remarkable in light of the fact that the bay is the largest and most conspicuous landform and natural resource in the region. General goals exist in all local plans for tidal water, but most fail to reflect

special knowledge or concern for conditions in the bay. Statements of expectations by the public are needed for the bay. These statements should describe bay features that should exist after some period of management effort. Goals should be verifiable, practical and meaningful. Above all, the goals should be formulated in an atmosphere of openness and concern for the wants and rights of all people who have an interest in the bay.

At this stage of pre-planning it is possible to establish five preliminary goals for the proposed National Estuary Program Study of Sarasota Bay:

GOAL I: ESTABLISH A VERTICALLY INTEGRATED MANAGEMENT SYSTEM FOR SARASOTA BAY;

GOAL II: MAINTAIN THE EXISTING ENVIRONMENTAL QUALITY OF THE BAY AND ELIMINATE EXISTING PROBLEMS;

GOAL III: ANTICIPATE AND PREVENT THE DEVELOPMENT OF FUTURE BAY PROBLEMS;

GOAL IV: ENHANCE THE USE OF SCIENTIFIC KNOWLEDGE AND PUBLIC PARTICIPATION TO REACH INFORMED MANAGEMENT DECISIONS;

GOAL V: GENERATE BAY MANAGEMENT PROCEDURES AND PRODUCTS OF NATIONAL SIGNIFICANCE.

Objectives are action statements which operationally define the steps necessary to achieve a goal. In light of existing NEP planning and documentation, the nature of the goals stated for Sarasota Bay, and the need for consistency between the NEP and local initiative, the most meaningful objectives we can propose are based upon the seven purposes of NEP management conferences:

Objective 1: To assess trends in water quality, natural resources, and uses of Sarasota Bay;

Objective 2: To collect, characterize, and assess data on toxics, nutrients, and natural resources within Sarasota Bay to identify the causes of environmental problems;

Objective 3: To develop the relationship between the in place loads and point and nonpoint loadings of pollutants to Sarasota Bay

and the potential uses of the bay, water quality, and natural resources;

Objective 4: To develop a comprehensive conservation and management plan that recommends priority corrective actions and compliance schedules addressing point and nonpoint sources of pollution to restore and maintain the chemical, physical, and biological integrity of Sarasota Bay, including restoration and maintenance of water quality, a balanced indigenous population of shellfish, fish and wildlife, and recreational activities in the bay, and assure that the designated uses of the bay are protected;

Objective 5: To develop plans for the coordinated implementation of the plan by the states as well as federal and local agencies participating in the conference;

Objective 6: To monitor the effectiveness of actions taken pursuant to the plan; and

Objective 7: To review all federal financial assistance programs and federal development projects in accordance with the requirements of Executive Order 12372, as in effect on September 17, 1983, to determine whether such assistance programs or projects would be consistent with and further the purposes and objectives of the plan prepared under this section.

SUMMARY AND CONCLUSIONS

Sarasota Bay was identified in Section 317 (National Estuary Program) of the Water Quality Act of 1987 for priority consideration as an estuary of national significance. The bay is the only Florida system so identified. It is a very small, relatively clean system which ranks poorly where estuarine area or number of major problems are considered. On the other hand, it ranks highly in terms of preservation need. It is also distinguished by having more problems resulting from development and overuse than from pollution, especially the many forms of pollution which plague northern estuaries. In this regard, Sarasota Bay represents an excellent setting in which to develop and evaluate management tools focusing on development and overuse impacts. The small size of the bay is an added advantage in such a context. Overall, Sarasota Bay offers the opportunity to address nationally significant problems such as integrated beach/inlet/channel maintenance, nonpoint source control, habitat loss, and sea level rise. Results from a Sarasota Bay study would also be transferable to similar lagoons, bar-built estuaries, and small embayments throughout the gulf and south Atlantic coastlines.